

## Claims

### What is claimed is:

1. An assay stick, comprising:
  - 5 a reaction vessel;
  - a plurality of microbeads disposed within said reaction vessel;
  - each of said microbeads having at least one diffraction grating disposed therein, said grating having at least one refractive index pitch superimposed at a common location;
  - 10 said grating providing an output optical signal when illuminated by an incident light signal; and
  - said optical output signal being indicative of a code in said substrate.
2. The apparatus of claim 1 wherein said vessel is made of a glass  
15 material.
3. The apparatus of claim 1 wherein said vessel is a tube.
4. The apparatus of claim 1 wherein said code comprises a plurality of bits.
5. The apparatus of claim 1 wherein the number of pitches is indicative of  
20 the number of said bits in said code.
6. The apparatus of claim 1 wherein said beads have a length that is less than about 500 microns.
7. The apparatus of claim 1 wherein said beads have a cylindrical shape.
8. The apparatus of claim 1 wherein said grating is a blazed grating.
- 25 9. The apparatus of claim 1 wherein said code comprises a plurality of bits, each bit having a plurality of states.
10. The apparatus of claim 1 wherein said substrate has a reflective coating disposed thereon.

11. The apparatus of claim 1 wherein said substrate is has a magnetic or electric charge polarization.

12. The apparatus of claim 1 wherein said substrate has a grating region where said grating and a non-grating region where said grating is not located; and  
5 wherein said substrate has a plurality of grating regions.

13. The apparatus of claim 1 wherein said substrate has geometry having holes therein.

14. The apparatus of claim 1 wherein said substrate is has a geometry having protruding sections.

10 15. The apparatus of claim 1 wherein at least a portion of said substrate is has an end cross sectional geometry selected from the group: circular, square, rectangular, elliptical, clam-shell, D-shaped, and polygon

16. The apparatus of claim 1 wherein at least a portion of said substrate is has a side view geometry selected from the group: circular, square, rectangular,  
15 elliptical, clam-shell, D-shaped, and polygon.

17. The apparatus of claim 1 wherein at least a portion of said substrate is has a 3-D shape selected from the group: sphere, a cube, a pyramid.

18. The apparatus of claim 1 wherein said code comprises at least a predetermined number of bits, said number being: 3, 5, 7, 9, 10, 12, 14, 16, 18, 20, 24,  
20 28, 30, 40, 50, or 100.

19. A method of performing an assay, comprising:  
obtaining a reaction vessel having a plurality of microbeads disposed therein;  
each of said microbeads having at least one diffraction grating disposed  
25 therein, said grating having at least one refractive index pitch superimposed at a common location;  
said grating providing an output optical signal when illuminated by an incident light signal; and  
said optical output signal being indicative of a code in said substrate.

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20. A method of reading a code in an optical identification element,  
comprising:

obtaining an optical substrate at least a portion of which having a diffraction  
grating with one or more refractive index pitches superimposed at a common location;  
5 and

illuminating said substrate with incident light, said substrate providing an  
output light signal;

reading said output light signal and detecting a code therefrom.

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